

DRAINAGE OF WOUNDS, WITH SPECIAL REFERENCE TO DRAINAGE AFTER URETHROTOMY.¹

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DRAINAGE in the treatment of wounds has been used from a very early day, but its estimated value has received more marked attention in modern times in connection with general antiseptic treatment. And yet opinion still fluctuates in regard to the need of this means as a portion of the technique of modern wound treatment.

The practical surgeon of large experience must occupy a safe middle ground in the discussion of the value of drainage *per se*. The most tenable position is that which holds that every wound must be treated as a unit to secure the best results, and have the patient subjected to the minimum amount of danger.

Safety from local and general infection and certainty of union *per primam* are the chief considerations held in view. The latter result, though generally desirable, is, however, never to be sought at the risk of encountering the former. The time was when to escape the fearful danger of infection, the surgeon entirely ignored the advantages of primary union. The open treatment of wounds was then the fashion; but to-day this is practiced only in exceptional cases. Stuffing the wound spaces, or interposing at least some substance to prevent contact of surfaces; the rejection altogether of wound dressing, or the substitution of some slight protection for the

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layers of charpie smeared with cerate, as used in the French hospitals thirty years ago; or the heavy compresses of cotton used elsewhere to occlude the wound; the total abandonment of sutures and adhesive strips for accurately closing wounds, and the resort to *debridement* of deep wounds—were a few of the methods which then took the place of modern plans for effecting drainage.

Primary union was, by one or other of these means, rendered almost impossible, but notwithstanding this, secretions and exudates were not effectually disposed of, and infection or sepsis was by no means prevented.

This was before the introduction of the germ theory, or the study of bacteria or phagocytes—before Listerism attracted attention or threatened, as it has done, to revolutionize surgical doctrines and treatment.

The danger resulting from the retention of blood and inflammatory secretions, as well as the subsequent putrescency of these materials, was fully recognized. The necessity for the escape of blood, serum, lymph and pus was admitted.

By preventing primary union, making free openings in the tissues, and utilizing the principle of gravity, the proper indications for treatment were to a fair extent carried out. Wounds of natural cavities were known to be extra dangerous, and the closed spaces of wound surfaces were looked upon as cavities upon a small scale, and dangerous because of their capacity for retaining secretions or exudates.

Another fact was fully recognized, viz., that subcutaneous wounds enjoyed freedom from infection.

Where no air entered, no decomposition or sepsis was feared, and no pus was looked for.

Still, the entrance of a living germ was not regarded as necessary to the formation of pus.

When, finally, Listerism came with its germ theory, as associated with infection, it did not pretend to disregard many of the old principles of treatment. It accepted many of the views to which I have briefly referred. But with the old knowledge it introduced a new factor to explain much that was obscure. It accepted the drainage of wounds as one of the most important features of treatment, but this simply because all

wounds were not subcutaneous in character. It announced the great importance of excluding germs from without; no germs, no decomposition, no putrescence, no infection, no suppuration, as a rule.

But Listerism did not insist upon the doctrine, no suppuration without bacteria. If this latter be true it is an advance beyond what Lister claimed.

With free drainage, as practiced in our own times, we can insist that the ingress of germs, or their lodgment, is improbable and uncertain. And, further, it is comforting to believe that all micro-organisms found in the tissues are not potent for evil. Primary union and the absence of infection are often noticeable where bacteria have had ingress, or where they have been purposely introduced. Dangerous germs are at times controlled or destroyed by leucocytes that pertain physiologically to the parts. The war of cells, then, must not be forgotten as one of the possible contingencies which may assist the surgeon.

However, the conservative surgeon, in the face of the recognized facts referred to, must prefer to exclude the possibility of the entrance of germs, while he provides specially for the escape of exudates.

Further, he prefers in the treatment of wounds to guard against all chances of decomposition within the wound, to make use of agents known to be inimical to germ life, and to use as dressings materials which will act as barriers to the ingress of all germs from without.

Accepting even the doctrine of phagocytosis, or the ability of some cells to absorb and digest microbes, he need not, because of a specious theory, jeopardize the safety of his patient.

This scheme of treatment, together with the necessary prevention of further traumatism by proper rest and protection, may be said to constitute modern Listerism.

There may be differences of opinion as to the real value of the several factors going to make up the ideal treatment, but this does not detract from its value as a method promising good results.

The above remarks, though properly pertaining to the subject of wound drainage in general, are especially pertinent to

the subject of drainage in connection with the operation of urethrotomy.

We have in connection with such operations a narrow and tortuous canal, not strictly uniform in calibre, but physiologically narrower at regions; connected anatomically with surrounding and contiguous structures which present complications when suffering from the effects of lesions; related to muscles, blood vessels and nerve tissue which, under associate injury, or sympathetic disturbance, give at times serious results, or afford predominant symptoms to be duly recognized if treatment is to be successful.

This canal is a conduit, too, for an important secretion which in traumatisms becomes a most important factor in determining the results which are to follow.

The commingling of this secretion, either in its physiological or pathological condition, with the blood or inflammatory products, or with foreign germs which may occupy regions of the canal, or its entrance into spaces created through traumatisms, may at once determine the issue which decides the fate of the individual. It must not be supposed, however, that we are disposed to regard the many serious consequences that are reported to have followed urethrotomies as always attributable to conditions which drainage is capable of obviating. The peculiar nervous arrangement of the deep part of the urethra and the prostatic region, or neck of the bladder, we regard as often responsible for serious symptoms, and sometimes for death.

These results can at times be explained in no other way; but we are perfectly justifiable, however mortifying it may be from a scientific standpoint to say so, to speak of nervous sympathy, reflex irritation and disturbance of the sympathetic system, in connection both with slight and grave conditions encountered.

The passage of a catheter or bougie will, in some instances, be followed by a severe chill, by syncope or by convulsions, and, later, by bloody urine, or by the total arrest of urinary secretion, or by rise of temperature and other signs of acute pyrexia. Independent of the nervous connection, however, there may be serious hæmorrhage, and the blood may flow

either toward the meatus and there escape, or backward and enter the bladder. Wounds of the bulbo-membranous region are often followed for many days by bloody urine. There may be both clotted and fluid blood mixed with the urine, and at times the bladder fills to such an extent with blood clot that it cannot be properly emptied even by the use of the catheter. Clots lodge likewise in the wounds, and decomposition may occur in the bladder and outside of it. The admixture of unhealthy urine with blood and inflammatory exudates almost certainly generates a poisonous material, and now may rapidly supervene all the marked symptoms of septicæmia, sapræmia or pyæmia. Bacteria soon abound, and whether introduced from without, through the meatus, or reaching the bladder and deep wounds by other channels of entrance, they play the important role which compels us to associate them with the fearful casualties so long known to surgery. All parts of the urethral canal are not, however, alike susceptible, or to the same extent responsible for the development of serious disease. The deeper the site of the lesion, as regards the length of the canal, perhaps the greater the likelihood of there being developed the serious pathological conditions to which I have referred. Wounds at the meatus rarely give trouble in this way. The pendulous, or penile portion, of the canal readily drains toward the meatus. The uninterrupted flow of healthy urine will serve to remove clots, and tend to keep all anterior wounds free from noxious elements likely to occasion infection. With the presence of diseased urine, however, even the anterior portion of the canal may enjoy no immunity from sepsis, and the deeper portion affords constant evidence of the serious nature of lesions under these adverse conditions. Internal urethrotomy of the deeper part of the canal can hardly be regarded, in the light of modern knowledge, as a warrantable operation.

It becomes, then, a practical question whether drainage can not obviate these serious calamities connected with urethrotomy, how it can be used to the best advantage, and in what kinds of urethral operations it is most imperatively demanded.

Both drainage of the bladder and drainage of the urethral canal must be considered in this inquiry, and under the conditions both of physiological and pathological states of the

urinary secretion. We need not stop to remark upon what constitutes unhealthy urine, and the means of determining its existence.

The character of the urine, so far as it concerns the surgeon, in regard to its probable effect upon urethral wounds, may be easily ascertained by inspection, by its odor, its viscosity, its specific gravity, or by its behavior under proper chemical and microscopical examination. But the proper rule for the surgeon to observe in dealing with all urethral lesions is to err on the safe side, and protect in all cases against the possibility of an abnormal secretion. Fortunately we have modern means at our disposal, capable of quickly modifying many morbid conditions of the urine. In boracic acid, salol, saccharine and other articles, we have valuable adjuvants to the common surgical resources. Drainage of the bladder is all that can be desired when the natural expulsive powers of the organ are intact, when there is, of course, no paralysis, no dilatation, no sacculated condition, no thickening of its walls; no cystitis, no obstruction at the neck, and no narrowing of the urethral canal.

With healthy urine, physiologically expelled, there is no serious apprehension to come from lodgment or detention of the secretion after urethrotomies of the penile portion of the canal. The natural passage of healthy urine will, on the contrary, as already suggested, serve to protect from many dangers. Blood clots are washed out, inflammatory secretions are diluted and removed; pathogenic bacteria are not permitted to lodge and germinate. The natural drainage of the bladder, then, is the best drainage when we are assured of the healthy state of the urine. The only question is, whether we shall always admit the healthy condition of the secretion, or whether it is safer to assume that it is not healthy, and to protect the urethral wound accordingly; in other words, whether we should not always drain the bladder artificially and prevent any contact of urine with the wound?

In determining this question we must not forget to estimate the probable injurious effect upon the wound of the use of even the most improved instruments for artificial drainage. This drainage is accomplished by the use of the catheter, which must pass the entire length of the canal to reach the

bladder. Then, this must be allowed to remain in position, or it must be withdrawn and again introduced as many times a day as may be necessary. In either instance the wound is irritated and the procedure painful. Then the retained catheter becomes, sooner or later, obnoxious to the bladder, and possible complications may arise from persisting in its use.

Drawing off the urine from time to time almost certainly insures the frequent contact of the secretion with the wound, no matter how carefully the catheter is used.

Neither is a third plan, often resorted to, viz., retaining the catheter in the canal with the eye just anterior to the neck of the bladder, and only urging it onward into the cavity when it is desired to drain off its contents, any less objectionable.

The larger our experience, the less satisfied have we become with the use of the catheter *à demeure*. No matter how well it be secured it is liable to be misplaced, accidentally, or by the efforts of the patient. The soft rubber catheter generally used, will, in time, under the irritable action of the bladder, be doubled up so that the beak emerges from the cavity and some urine, of necessity, escapes with it.

We subject the patient to all the annoyances of the instrument, and we encounter the very evils that it was our object to avoid.

When the catheter *à demeure* is resorted to, however, we always prefer the old stiff, English, elastic instrument, now but seldom used. It can be better secured at the meatus, and it is much less likely to double up or to protrude from the cavity under the contractions of the organ. Anodynes, internally or by the rectum, will help to quiet the bladder and better insure the retention of the catheter. But in all cases of urethrotomy of the penile portions of the canal, our preference is for natural drainage of the bladder and of the canal, and the rejection of the catheter. The urine I try to modify in advance by the use of salol, boracic acid, citrate of potash, etc. The bladder is also, when necessary, treated in advance by suitable injections. After this the urethrotomy is done and the patient allowed to urinate by the natural way.

In cases of undue hæmorrhage a large sized English catheter is tied in for 24 or 48 hours, and then removed. Where

the catheter *a demeure* is used, of course drainage of the wound and the urethral canal goes on outside of the wall, and this may be all that is necessary. Where no catheter is employed there is the opportunity, which I always embrace, of washing out the canal by the meatus, several times a day, with Thiersch's or some other unirritating, antiseptic solution.

Internal urethrotomy, as practiced upon the deep urethra or any portion at or posterior to the bulbo-membranous junction, must always give rise to much greater solicitude than the operation on the anterior portion of the canal. Here, drainage of the bladder alone is not the important question. The drainage of the canal from the site of the wound is the chief consideration, but at the same time, the bladder has to be drained as in the anterior operation, and even more care should attach to protecting the wound from the contact of urine. Natural drainage cannot be trusted to, for this is not necessarily efficient. The flow of blood and inflammatory secretions is as likely to be backwards, to the bladder, as forward to the meatus. The natural relation of all the parts is such, that drainage in either direction is uncertain, and lodgement of products is likely to obtain. We have then the very conditions favorable to sepsis and local and general infection. Infiltration of urine, too, is one of the serious evils to be apprehended, and so is hæmorrhage.

Where such operation is practiced, surgeons are almost uniformly of opinion that a catheter should at once be passed into the bladder and retained for 24 or 48 hours. This is to guard from hæmorrhage and from urinary infiltration, as well as to protect the wound from the effect of urine, which is by many regarded as injurious in its effects even in its normal condition. Drainage goes on, of course, only along the outer wall of the retained catheter. But is this efficient, and is it safe to trust to so imperfect a method? We would not so regard it in case of more open and superficial wounds when we thought drainage necessary. Tubular or capillary drainage, in such cases, we would regard as necessary. The capillary drainage outside of the catheter, and from so deep a wound, is surely most imperfect.

From what we have already said upon the use of the catheter

for bladder drainage in anterior urethrotomy, it will be seen that we can place no reliance upon it here. We have learned this to our sorrow. What surgeon has not had the experience that I have had, in visiting the patient the first or the second day after operating and learning that the beak of the catheter has been many times in and out of the bladder or that the instrument had doubled on itself and escaped during the night. The most intelligent patient cannot be made to realize the danger of the escape of the instrument, and all that he will do, is to push the instrument back when he finds that it has escaped or shows a tendency to escape, from the bladder. A conscientious nurse will serve no better purpose.

Experience has thus led me to believe that internal urethrotomy in the deep portion of the canal is an unsafe operation. The parts cannot be drained except by a direct perineal opening. Such operation, then, should be rejected unless it be followed by the counter opening through the perineum. The distinction has been made by some, and external urethrotomy separated from what has long been called, perineal section. This is hardly necessary and can have reference simply to the external division of parts being in the one case somewhat anterior to the usual site of the perineal wound. We prefer to say that perineal section should take the place of internal, deep, urethrotomy. The comparative ease in the performance of the respective operations and the other arguments in favor or against such procedure, we do not desire here to discuss. Our present argument against the operation of deep internal urethrotomy, and our preference for perineal section, rests simply upon the question of efficient drainage. This is impossible in one operation, but can be made most efficient in the other.

As to the mode of operating, with or without a guide, we have nothing to do. We only urge, that if the deep internal contractions of the canal is divided by the urethrotome, there should be as well an external free incision. Through this incision both the bladder and the deep part of the canal should be drained.

But how is this to be best accomplished? The usual plan has been to drain simply by the retained catheter as after in-

ternal urethrotomies. That is, convey the urine away by the catheter and allow the wound and the urethral canal to drain outside of the walls of the retained instrument. This, I regard, as unsatisfactory and unsafe. The necessity of artificially draining the bladder, I would urge only in cases where the urine is abnormal. Under other circumstances the patient may be allowed to urinate voluntarily, the escape, of course, being through the perineal wound. Where the bladder is to be drained, this should be by means of a short catheter, or tube, passing through the perineal wound to the bladder as after some lithotomy operations. This tube should be sufficiently rigid so as to be incompressible and not capable of being doubled up by the contractions of the organ. It may be of rubber, or of silver, of large calibre. It is best secured at the perineal wound by a strong silk suture passed through the cutaneous structures. More important than the drainage of the bladder is the thorough drainage of the urethral canal.

If more than one stricture has been divided, as is generally the case when perineal section is required for a deep contraction, the greater the necessity of this drainage of the entire canal. The plan I adopt is to pass a full sized tube, having velvet-eyed perforations, through the canal, from the meatus to the perineal wound. It must be long enough to project through both apertures. The perineal end of the tube is secured to the tegumentary wound by a silk suture, just as with the tube coming from the bladder. All fluids now pass readily from the canal; none can be detained in the deep portion. If there be hæmorrhage, the blood will appear externally and not pass back into the bladder. Further, by means of a syringe, the entire canal can be well washed out from time to time with a non irritating, antiseptic, fluid.

This practice I have now resorted to for a great many years. Although in the earlier part of my professional life, when adopting other plans generally in use, I had the misfortune several times to meet with fatal results after internal urethrotomy and frequently to encounter the most alarming symptoms, since appreciating the principles and adopting the practice here briefly outlined, the results have been all that could be desired.

The following conclusions may be thus formulated:

I. Urethrotomies for strictures of the penile portion of the urethra, including the meatus, require no artificial drainage.

In case the urine is healthy the natural passage of this is sufficient to prevent lodgement of blood or inflammatory exudates and subsequent decomposition, putrescency and sepsis.

II. To insure against the action of unhealthy urine the secretion must be modified before resort to operation, by the use of proper medicinal agents, known to be efficient for this end. The bladder must also be treated, as preliminary, when its condition is such as to furnish diseased elements which give deleterious character to the urine.

III. If deemed necessary further to guard against the noxious character of the urinary secretions, the catheter *a demeure* must be resorted to for draining the bladder for 48 to 72 hours. The rigid English gum catheter is to be preferred to the soft rubber one, as less likely to be displaced.

IV. After internal urethrotomies of the deep portion of the urethra, drainage is most essential. This cannot be properly secured by the mere use of the catheter, and, therefore, it is best to abandon such operation, and to substitute for it a perineal section, or external urethrotomy.

V. After this latter operation, drainage goes on securely because of the direct external opening. It should, however, be more thoroughly insured by a *perforated* drainage tube, reaching from the meatus, and made to project through the perineal wound; this is to be kept in place from 3 to 5 days.

VI. Bladder drainage, after perineal, is not essential if the urine is healthy. By the voluntary efforts of the patient the urine flows readily from the bladder, and escapes through the perineal wound.

VII. To better insure the escape of urine, however, through the perineal wound, and also prevent its contact with all lesions of the canal, a short tube, of large calibre and rigid walls, may be passed into the bladder from the perineal wound, and kept in position by a suture passed through the tegumentary edge of the wound. This tube may be removed after three days.

VIII. The use of non-irritating, antiseptic injections through the tube occupying the canal, furnishes an additional precaution against sepsis. The bladder may also be easily washed out by means of the tube used for draining it through the perineum.